

# **IMAP Policy Oversight Group**

**October 13, 2006**

# What is IMAP?

- An interagency cooperative to build:
  - Mid-to broadscale planning and assessment models and tools
  - Wall-to-wall existing vegetation data
  - Ancillary data
- R6, Oregon Dept. of Forestry, BLM, PNW Research Station, The Nature Conservancy, Others?

# IMAP Needs

- State-wide forest assessment (ODF)
- Simple models for Forest plan revisions (FS R6)
- Wall-to-wall data and models for Northwest Forest Plan monitoring
- Better integration and application of research for partners (PNW research station)

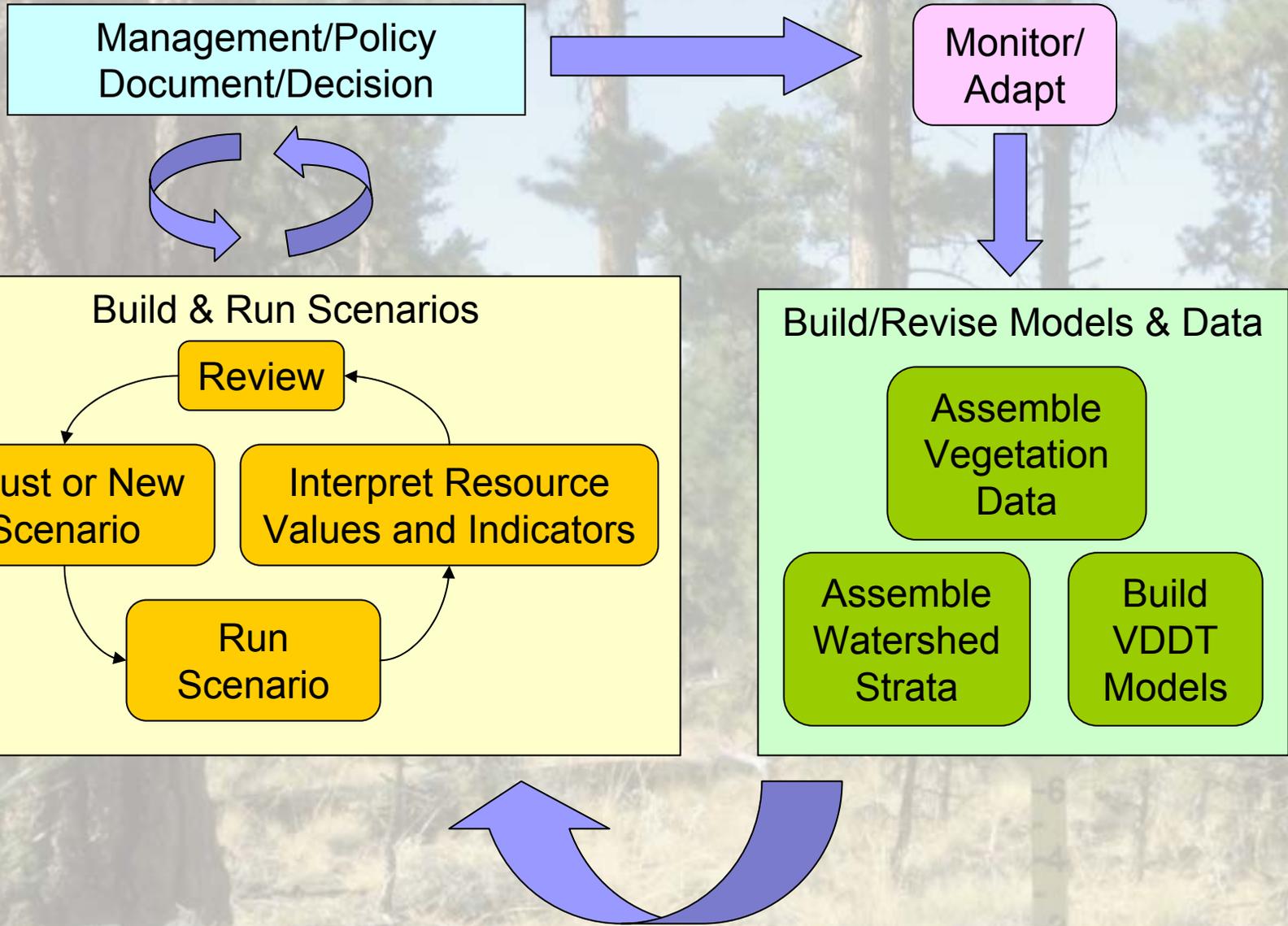
# Challenges that make IMAP Useful

- Limited and declining funds
- Very busy people
- No desire for conflicting answers to broad questions
- Need integrated answers – single resource perspectives not suitable
- “Black box” models

# An Approach

- Leverage and cooperate
- State and transition models
- Organize by geographic area
- Integrate natural disturbances and management activities
- Summarize to land units (watersheds)

# IMAP Information Flow



# Boxes and Arrows

## (States and Transitions)

### Vegetation Type A

Cover type: Ponderosa Pine  
Structure: Old single-story forest

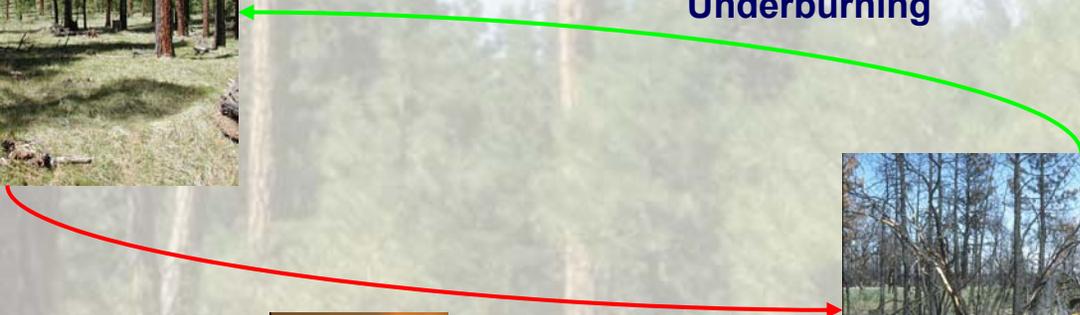


Regeneration  
Growth  
Underburning

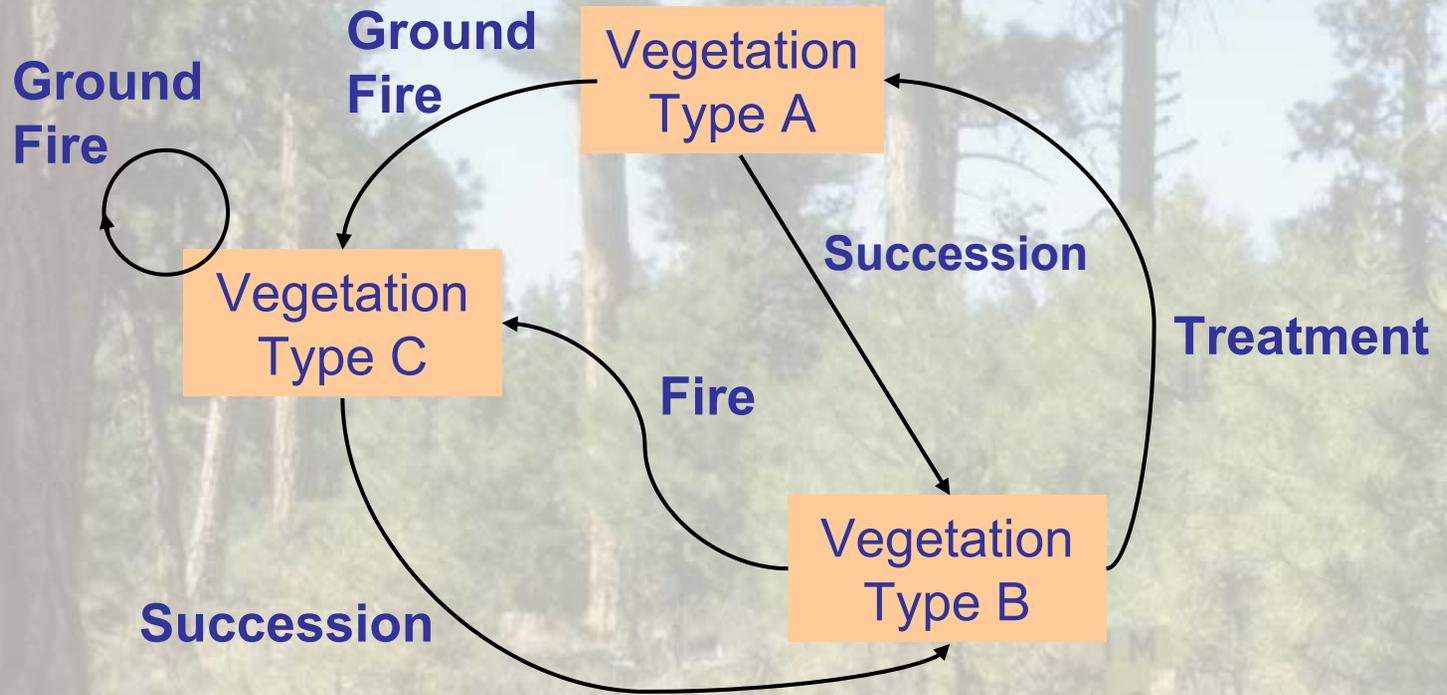


### Vegetation Type B

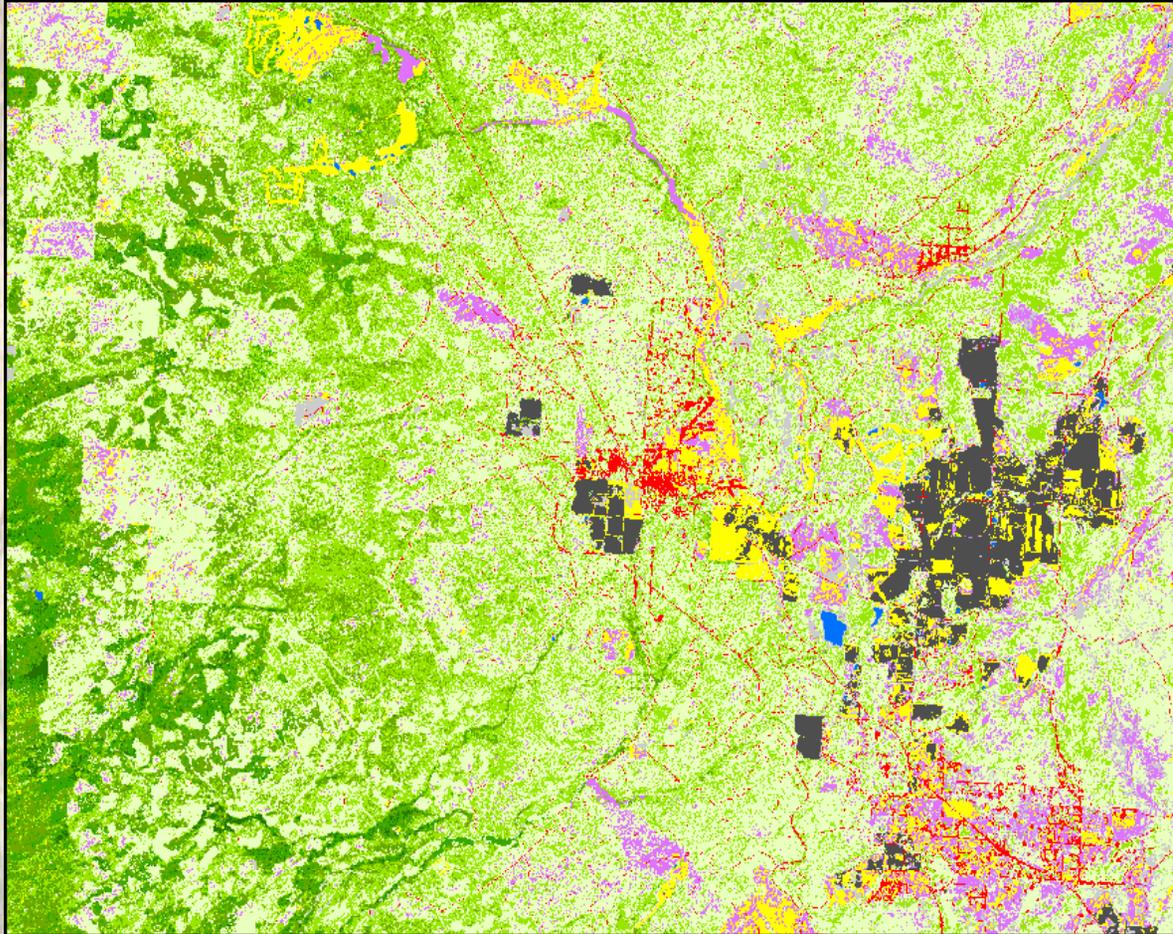
Cover type: Ponderosa Pine  
Structure: Non-Stocked, Post disturbance



# State and Transition Models



# Wall to Wall Current Vegetation Data



**Local data  
where  
better**

**+**

**ReGap for  
non-forest**

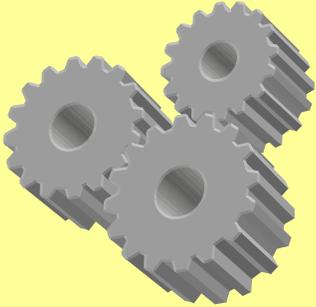
**+**

**Gradient Nearest  
Neighbor for forests  
(FIA and CVS plots  
assigned to 30 meter  
pixels)**

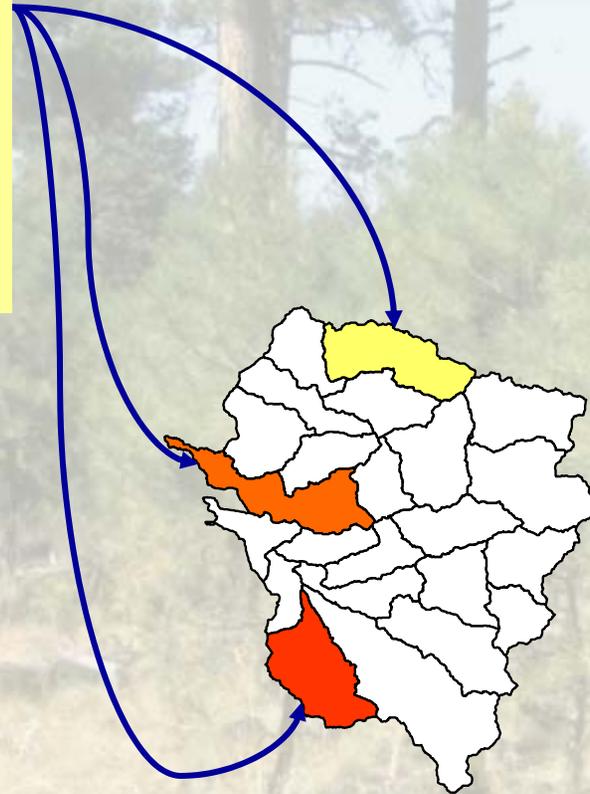
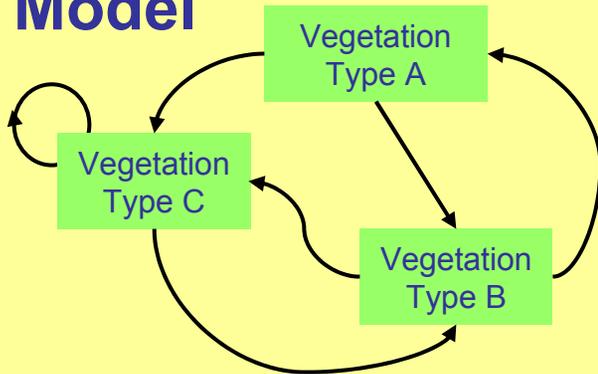
# Run Models by Watershed

## Database

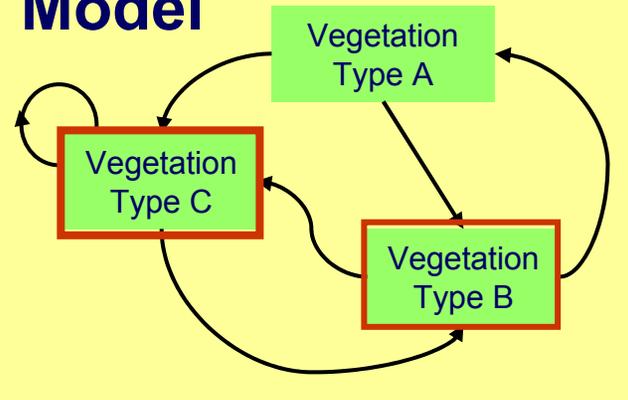
- Vegetation cover type, structure
- Disturbances
- Associated characteristics (e.g. wildlife habitat, products, etc.)



## Model



# Model



# Wildlife Habitat

**Acres & proportions**

## Habitat

Source Habitat Amount		
zero	0	<div style="width:0%; height:10px; background-color:lightgreen;"></div>
low	0	<div style="width:0%; height:10px; background-color:lightgreen;"></div>
moderate	100	<div style="width:100%; height:10px; background-color:lightgreen;"></div>
high	0	<div style="width:0%; height:10px; background-color:lightgreen;"></div>

Habitat Quality		
low	0	<div style="width:0%; height:10px; background-color:lightgreen;"></div>
moderate	0	<div style="width:0%; height:10px; background-color:lightgreen;"></div>
high	100	<div style="width:100%; height:10px; background-color:lightgreen;"></div>

## Risk factors

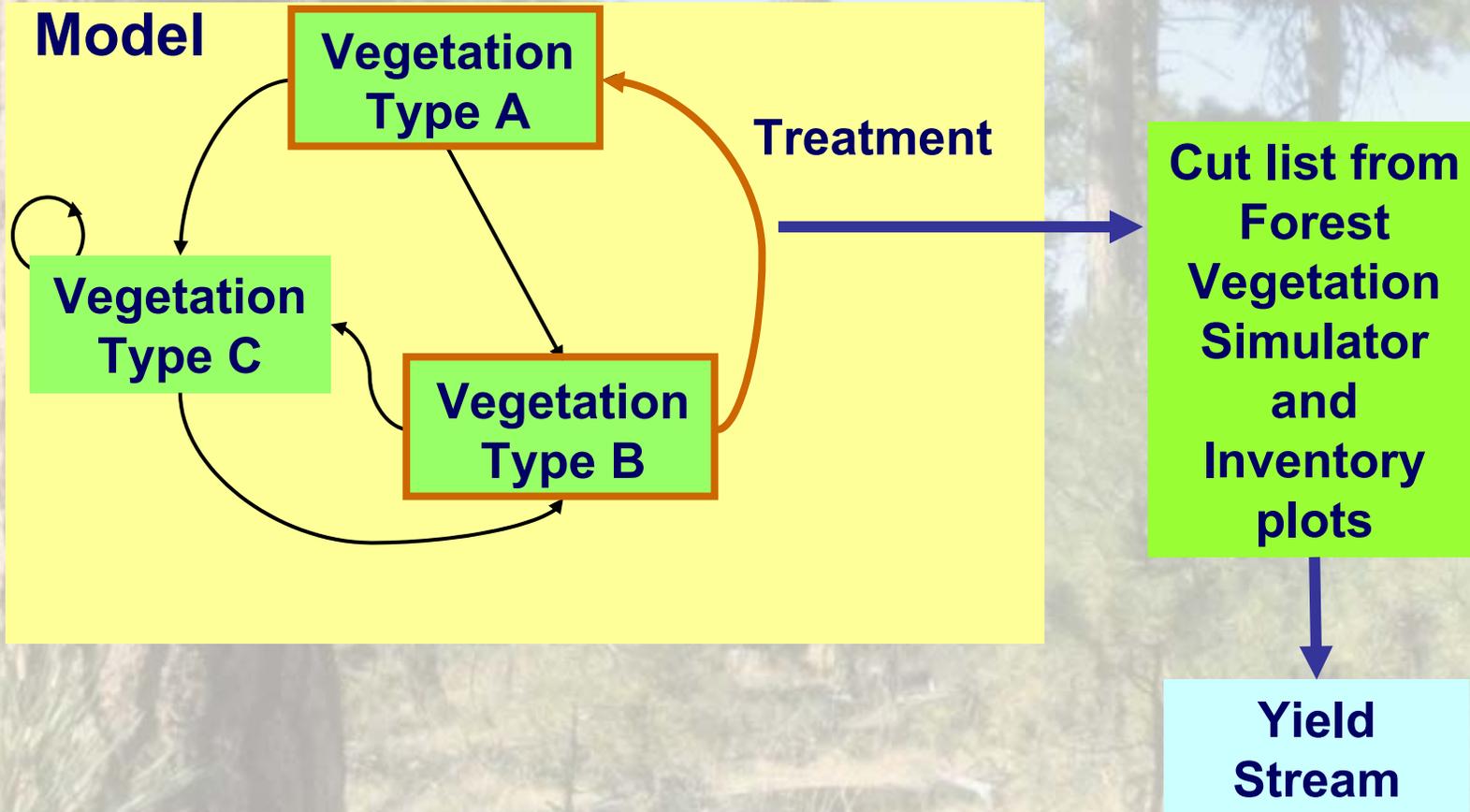
Human Disturbance		
low	0	<div style="width:0%; height:10px; background-color:lightgreen;"></div>
moderate	100	<div style="width:100%; height:10px; background-color:lightgreen;"></div>
high	0	<div style="width:0%; height:10px; background-color:lightgreen;"></div>

Habitat Index		
low	33.3	<div style="width:33.3%; height:10px; background-color:lightgreen;"></div>
moderate	33.3	<div style="width:33.3%; height:10px; background-color:lightgreen;"></div>
high	33.3	<div style="width:33.3%; height:10px; background-color:lightgreen;"></div>

Environmental Index		
low	25.6	<div style="width:25.6%; height:10px; background-color:lightgreen;"></div>
moderate	52.2	<div style="width:52.2%; height:10px; background-color:lightgreen;"></div>
high	22.2	<div style="width:22.2%; height:10px; background-color:lightgreen;"></div>



# Forest Products



A photograph of a pine forest. In the center, there is a light green rectangular box containing the text "Existing Vegetation" in bold blue font. In the bottom right foreground, a yellow measuring tape is visible, showing markings from 0 to 10 meters. The background consists of numerous tall, thin pine trees with green needles, set against a clear blue sky. The ground is covered with dry, yellowish-brown grass and some small shrubs.

# Existing Vegetation

# Mapping Current Vegetation in the Pacific Coast States with GNN, CART, and Other Tricks

**Landscape Ecology, Modeling, Mapping, and  
Analysis (LEMMA) team ([www.fsl.orst.edu/lemma](http://www.fsl.orst.edu/lemma))**

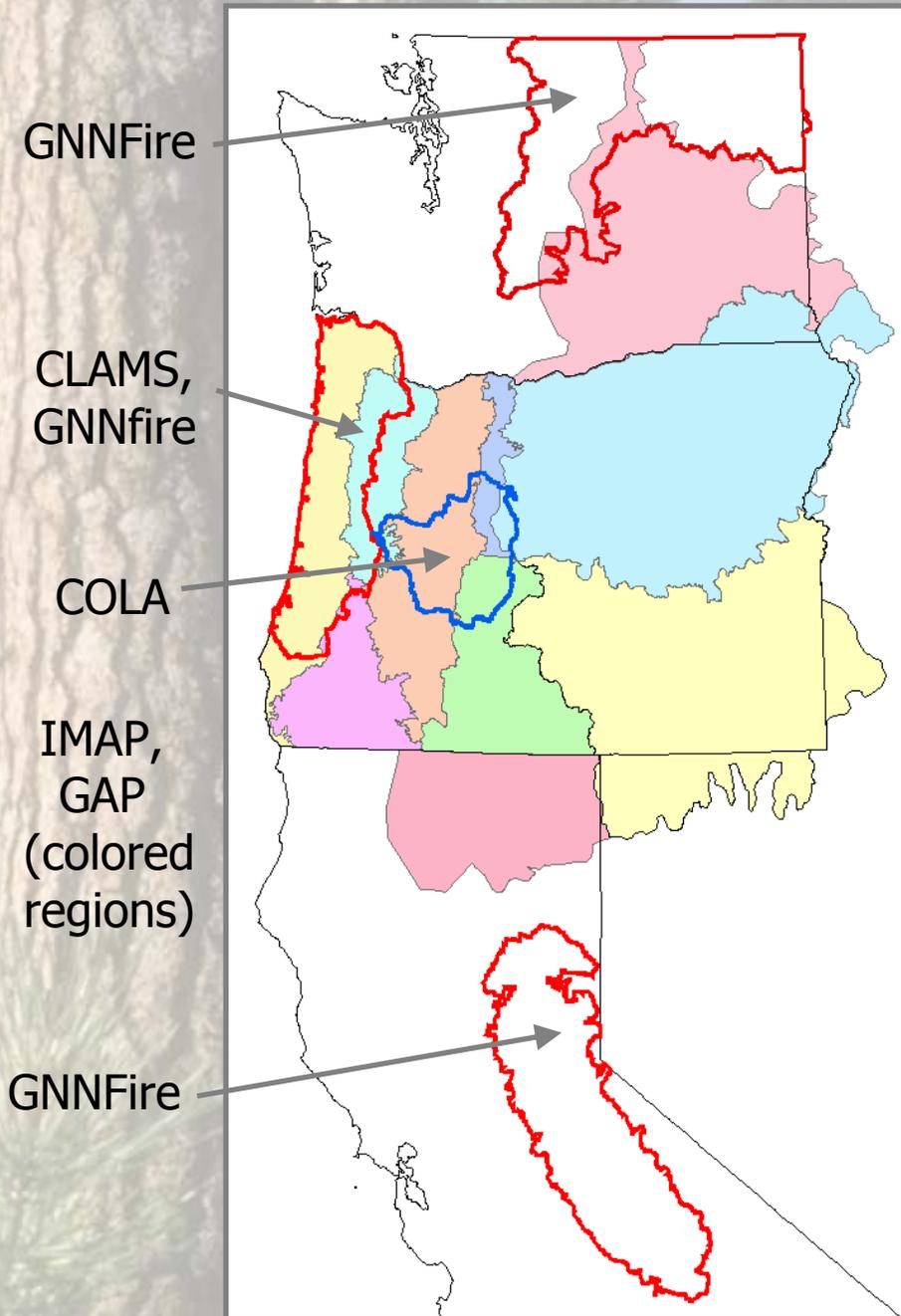
Janet Ohmann<sup>1</sup>, Ken Pierce<sup>1</sup>, Emilie Grossmann<sup>2</sup>,  
Matt Gregory<sup>2</sup>, Heather May<sup>2</sup>, Tim Holt<sup>2</sup>

*Collaborators:*

Jeremy Fried<sup>3</sup>, Jimmy Kagan<sup>4</sup>, Ken Brewer<sup>5</sup>, Miles Hemstrom<sup>6</sup>,  
Melinda Moeur<sup>7</sup>, Tom DeMeo<sup>7</sup>, Gary Lettman<sup>8</sup>, Mike Wimberly<sup>9</sup>

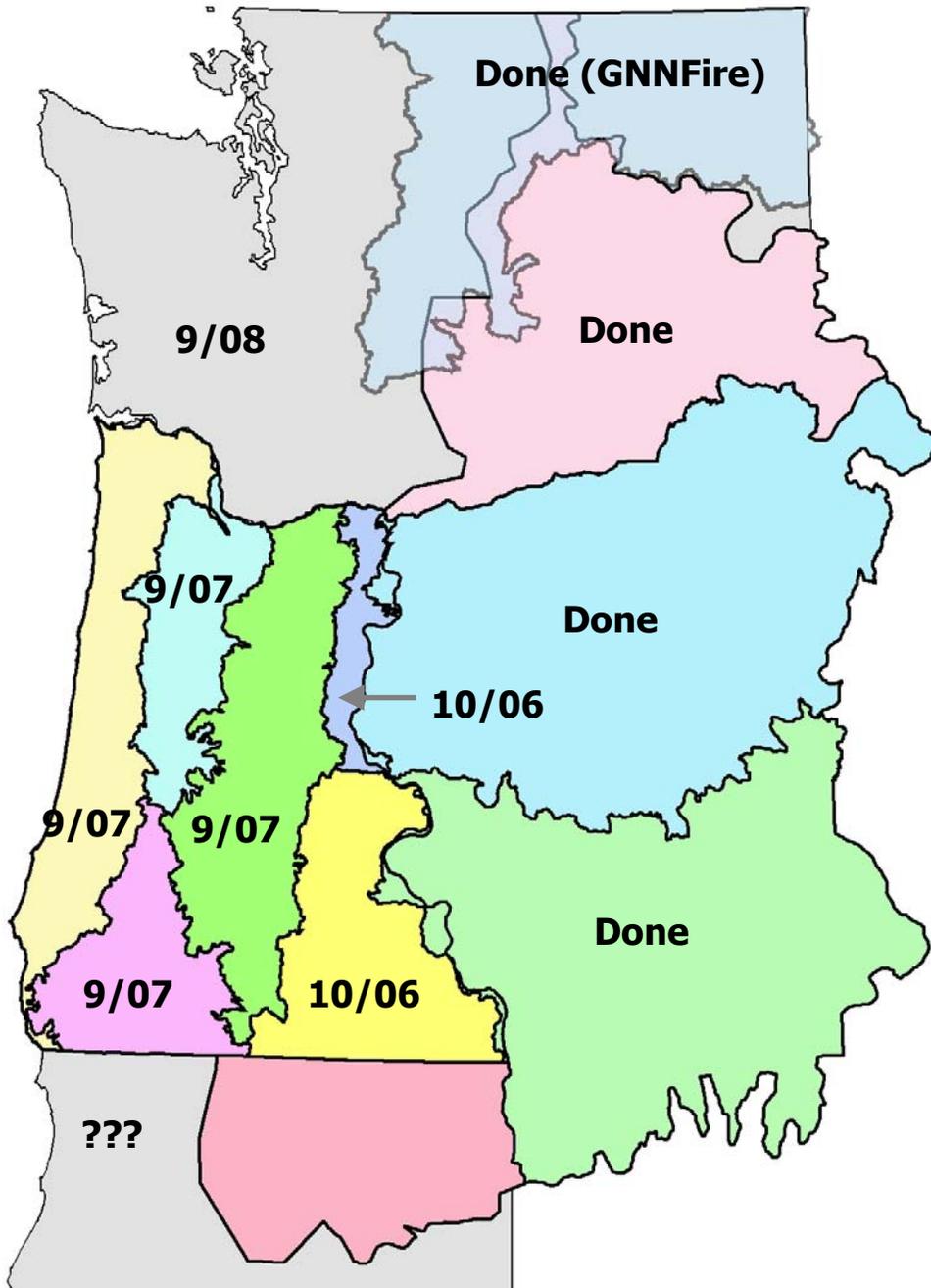
<sup>1</sup>USDA FS, PNW, Ecosystem Processes; <sup>2</sup>Oregon State University, Forest Science Department; <sup>3</sup>USDA FS, PNW, Forest Inventory and Analysis; <sup>4</sup>Oregon State University, Institute of Natural Resources; <sup>5</sup>USDA FS, Remote Sensing and Applications Center; <sup>6</sup>USDA FS, PNW, Focused Science Delivery; <sup>7</sup>USDA FS, Region 6; <sup>8</sup>Oregon Department of Forestry; <sup>9</sup>South Dakota State University

# GNN vegetation mapping projects and applications



- Landscape modeling and scenario analysis: IMAP, COLA, CLAMS
- NWFP Effectiveness Monitoring
- Land management planning (Forest Plans, BLM Cumulative Effects, etc.)
- Regional risk assessment (WWETAC)
  - Fuels mapping (GNNFire), real-time fire behavior (Finney et al.)
  - Fire Learning Networks (Upper Deschutes, Sprague)
  - National 250-m study (RSAC, Brewer et al.)
- Biodiversity assessment and conservation planning (Gap Analysis Program (GAP))
- Research applications

# 'Accelerated' Timeline for IMAP Vegetation Mapping



- NWFP area by 10/08 (CA???)
- ReGAP (Ecological Systems): all Oregon ecoregions by 12/07
- Map dates:
  - Oregon: 2000
  - Washington: 2005
  - Update/backdate to 1996, 2000, 2005 for NWFP???

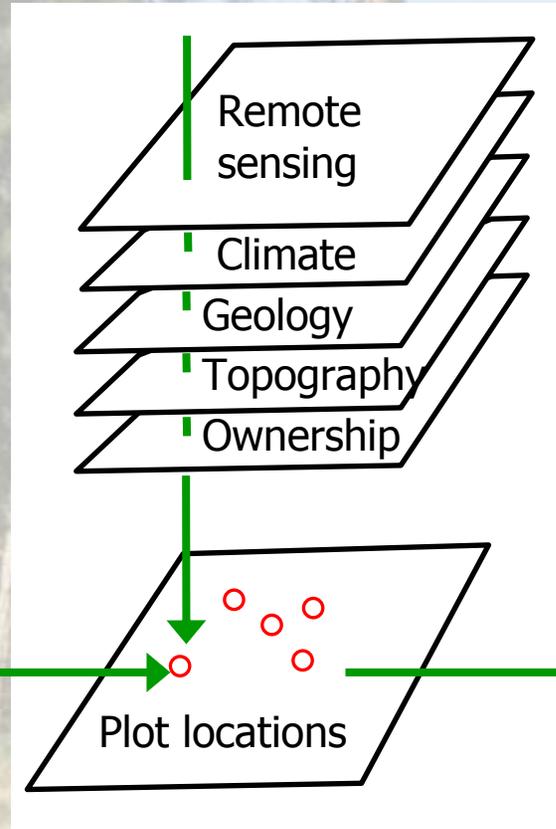
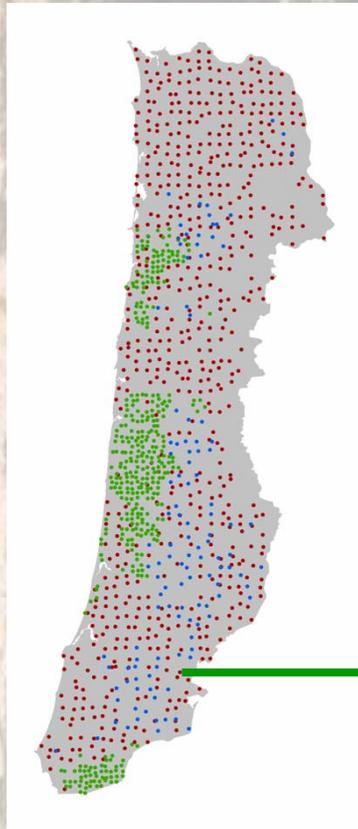
# Gradient Nearest Neighbor Method

*Plot data*

*Spatial data*

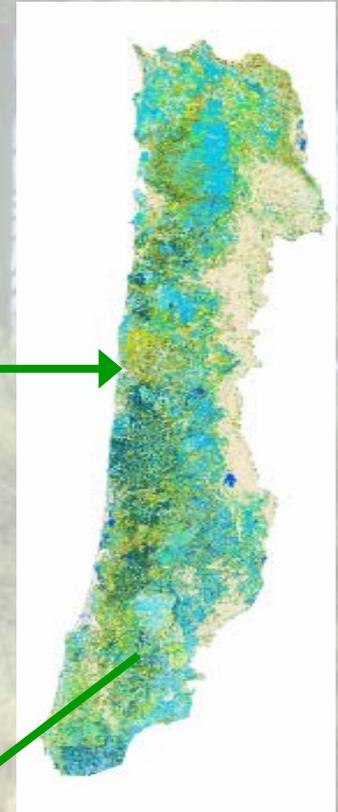
*Statistical model*

*Prediction*



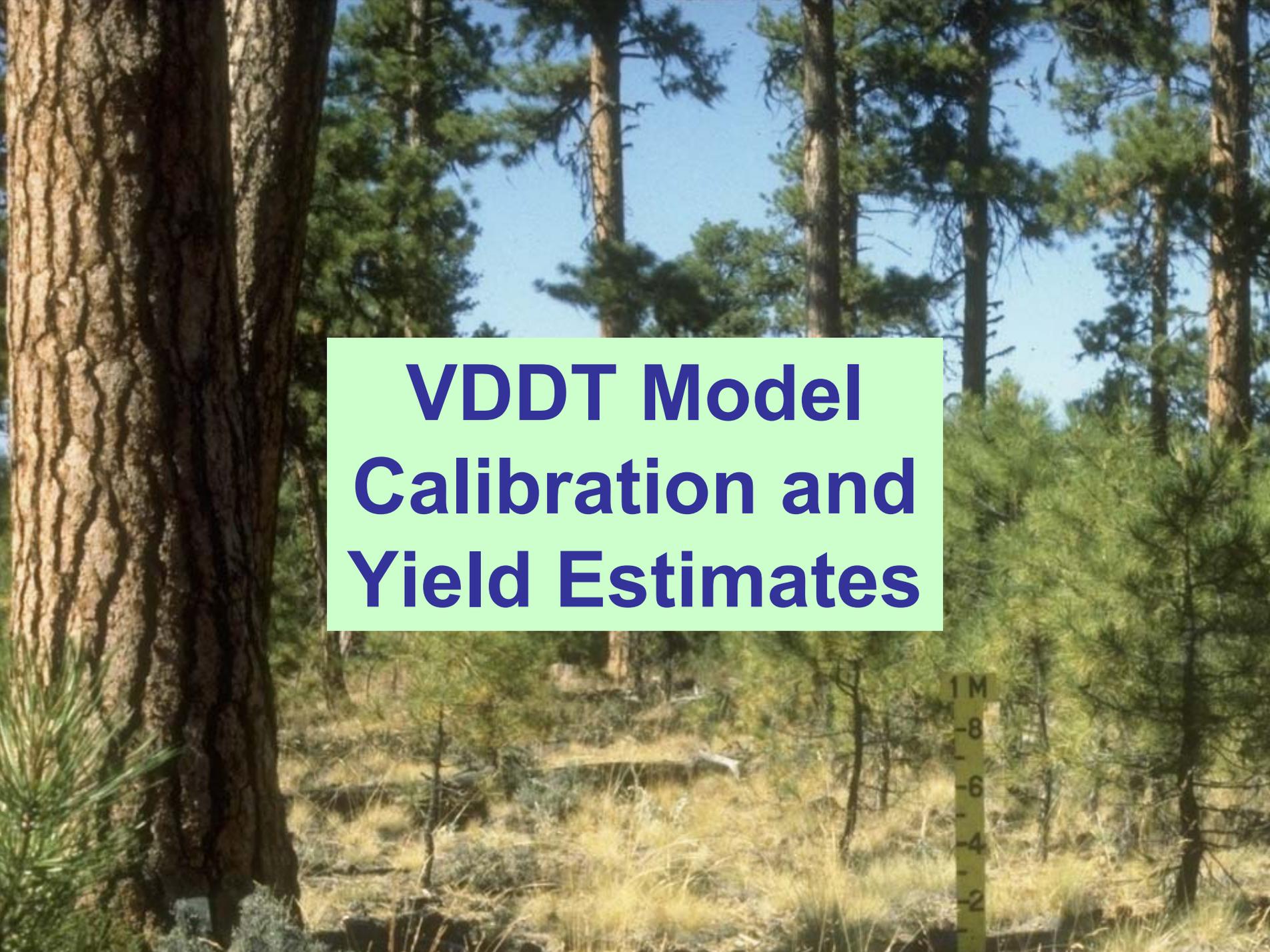
Imputation

Direct gradient analysis (CCA)



Pixel	PSME (m <sup>2</sup> /ha)	CanCo v (%)	Snags >50 cm (trees/ha)	Old-growth index	Etc ...
1	11	3	7.4	0.27	...
2	79	97	2.1	0.82	...

*Plot assigned to each pixel*

A photograph of a pine forest. In the center, there is a light green rectangular box containing the text "VDDT Model Calibration and Yield Estimates" in bold blue font. On the right side of the image, a yellow height scale is visible, marked with numbers 2, 4, 6, 8, and 1 M. The background shows several tall pine trees and a field of dry grass under a clear blue sky.

**VDDT Model  
Calibration and  
Yield Estimates**

Develop Existing  
Vegetation Maps  
Imagery plus DEMs,  
Climate, Geology,  
Soils, Ownership, etc.

GNN

Prepare Inventory Data  
FIA and CVS

Stratification  
-Ownership/Allocation  
-PVT  
-Covertime,QMD,  
Canopy Closure

FVS

Initialize  
Landscape  
Acres by Strata

VDDT

Build VDDT Models  
-Define state classes  
-Set/calibrate  
transition probabilities

Calibrate with FVS  
- Natural Growth Runs  
- Treatment Rx Runs

Run Scenario &  
Output Results

Estimate Transition Yields  
& State Values  
Timber, Fire & Fuels, Wildlife, etc

## Objectives

Use inventory data / G&Y models to empirically derive:

State & Transition model parameters

Residence times

Pathways

Transition Probabilities

## Outputs

Yield Profiles

Lookup Tables

# Calibrate Transition Probabilities and Estimate Yields

## VDDT state class Pre-Harvest

Covertime: PPmd\*  
Structure: Lm\*\*

\*Ppmd: Ponderosa pine,  
east-side mixed conifer  
early seral dry

\*\*Lm: Large tree,  
medium cover

Disturbance: PH.salv\*

\*Partial harvest (salvage)  
in post replacement classes

## Post-Harvest state class

Ppmd  
Go

Go: Giant tree-open

n(plots)		Transition	Yield
Pre-	Post-	Probability	Avg. CF vol/ac ± s.d.
31	14	.45	3747 ± 1252

Ppmd  
Lo

Lo: Large tree-open

31	9	.29	2935 ± 1405
----	---	-----	-------------

Ppmd  
Sh

Sh:Shrub

31	8	.26	4046 ± 1004
----	---	-----	-------------

↑  
Probs.

↑  
Yields

# Silvicultural Prescriptions

## FVS Event Monitor

- Regeneration harvest
- Selection harvest
- Precommercial thin
- Partial harvest (commercial thin)
- Salvage following disturbance
- Mechanical fuel treatment (noncommercial)
- Site prep and planting
- Prescribed fire non-lethal (underburn)

# Yields

FVS keyword files

Timber production

Volume, Biomass

Fire and Fuels

Crown bulk density, Torching index,  
Crowning index, CWD, FRCC

Focal Species Analysis

Snag density, Covertypes, Structure

Etc.

A photograph of a pine forest. In the foreground, a large, textured tree trunk is on the left. In the lower right, a yellow measuring tape is visible, showing markings from 0 to 10 meters. The background is filled with numerous tall, thin pine trees under a clear blue sky. A light green rectangular box is centered in the image, containing the text "Indicators & State-wide Assessment" in bold blue font.

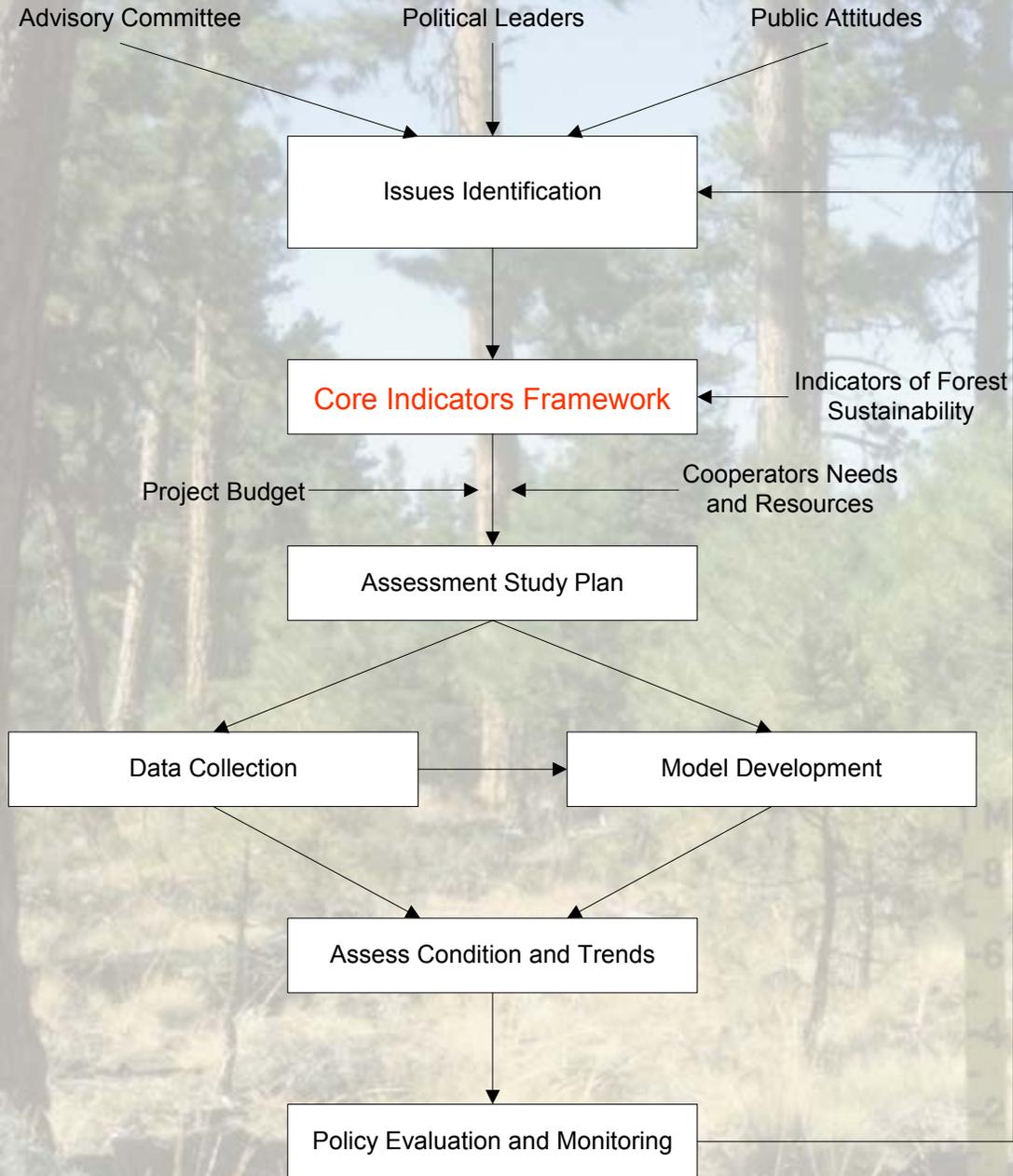
**Indicators &  
State-wide  
Assessment**

# Purpose of Indicators

- “Indicators can be used to focus monitoring, assessments, and research, so that Oregon can more clearly tell its own citizens and the rest of the world the story of how well our forests are being managed.”

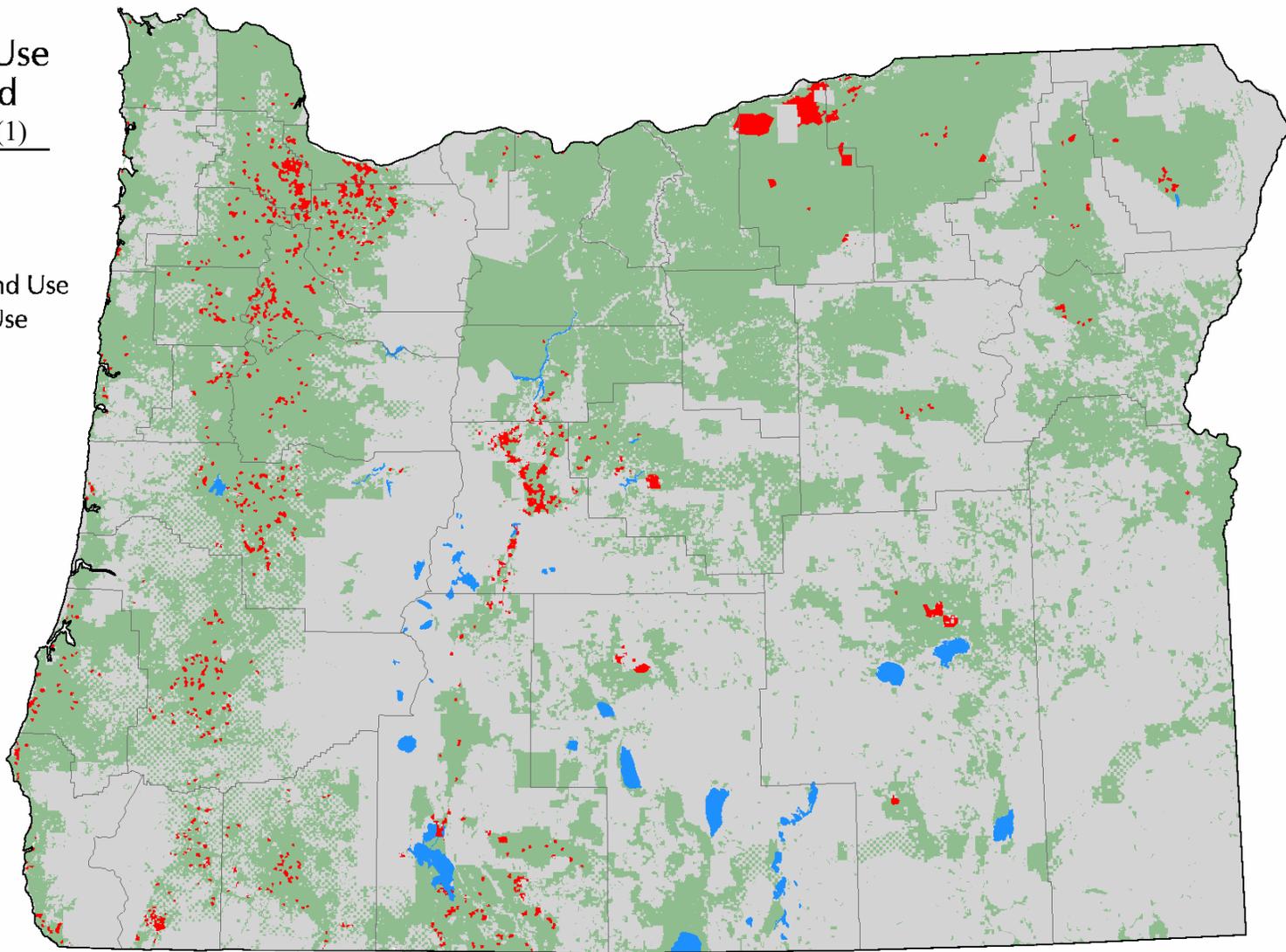
-- *Forestry Program for Oregon*, page 68

# FOREST ASSESSMENT PROCESS



# Change in Land Use On Private Land 1974 - 2000 (1)

- No Change in Land Use
- Change in Land Use
- Public Land
- Water



### Area of nonFederal Wildland Forest in Oregon, 1973-2001

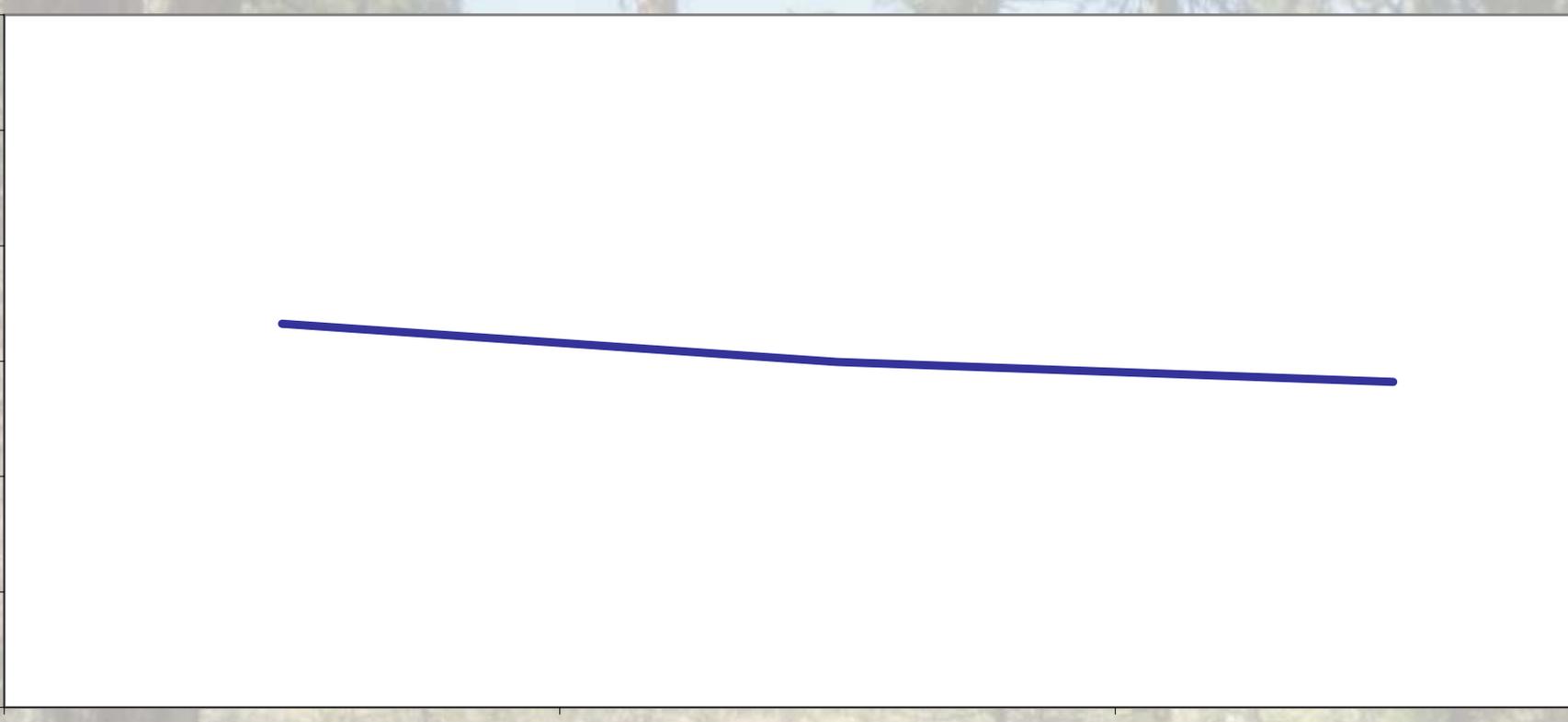
Thousand Acres

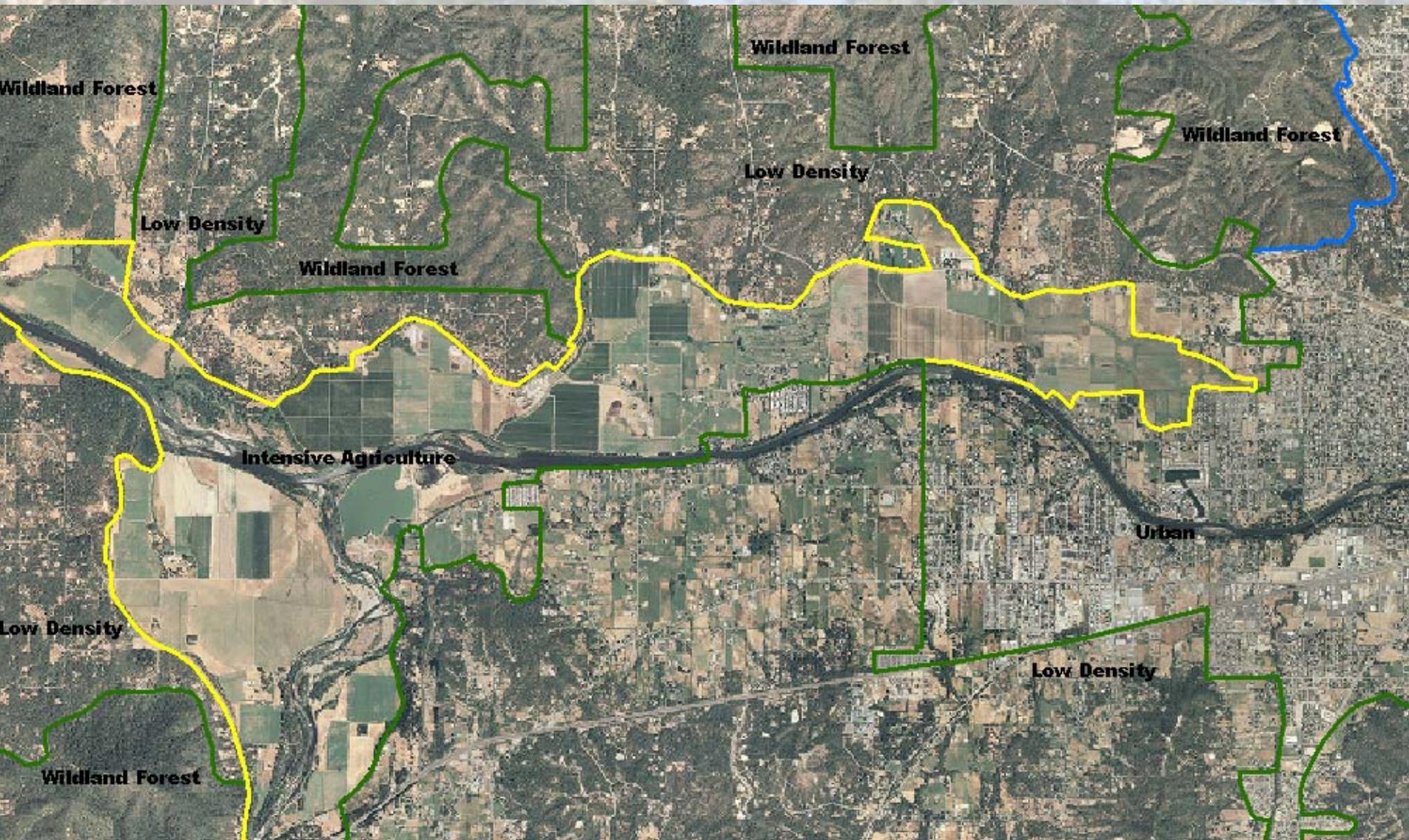
13000  
12500  
12000  
11500  
11000  
10500  
10000

1974

1984

2001





Wildland Forest

Wildland Forest

Wildland Forest

Low Density

Low Density

Wildland Forest

Intensive Agriculture

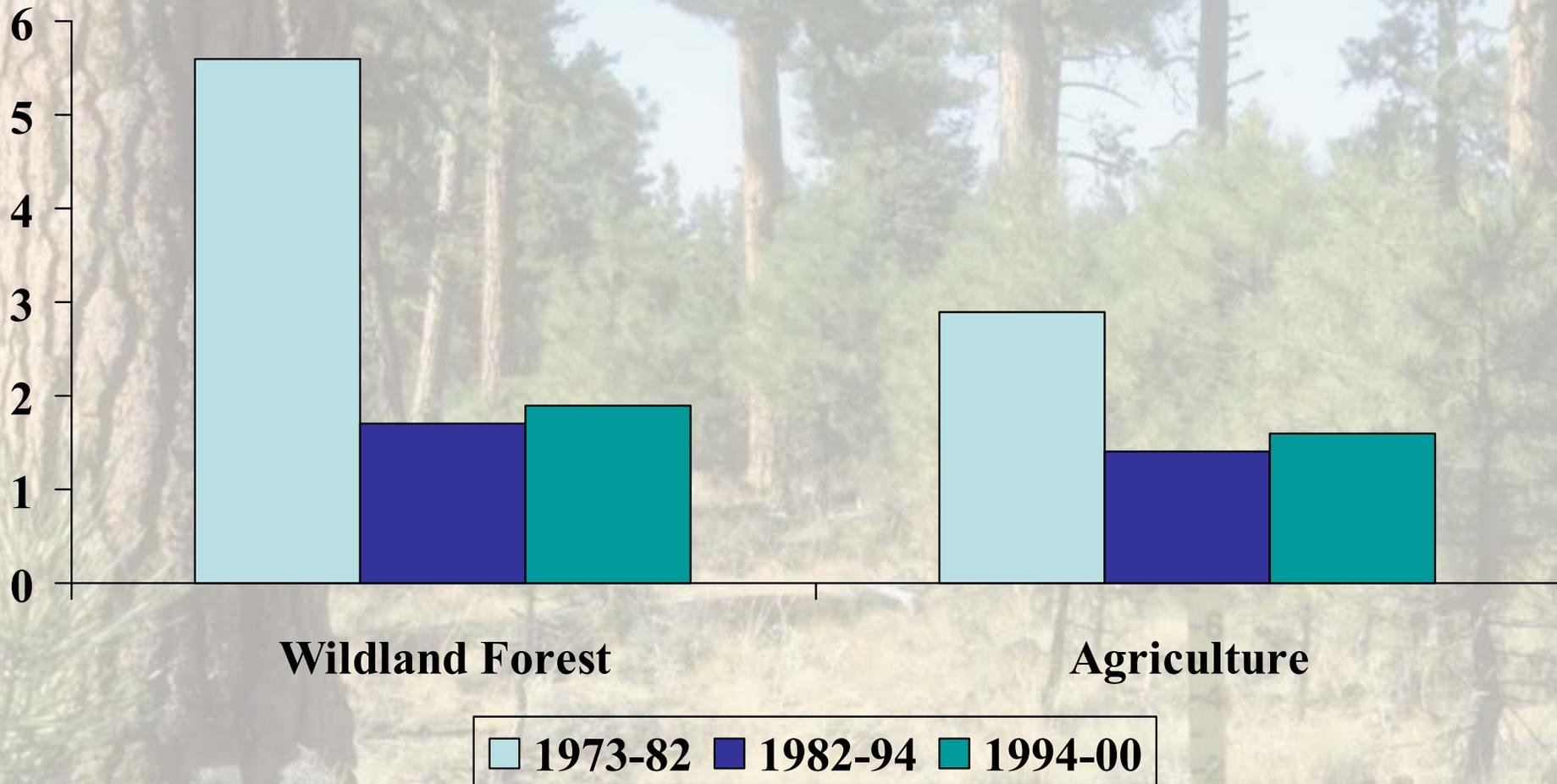
Urban

Low Density

Low Density

Wildland Forest

# Percent Annual Change in Dwellings Per Square Mile in Western Oregon

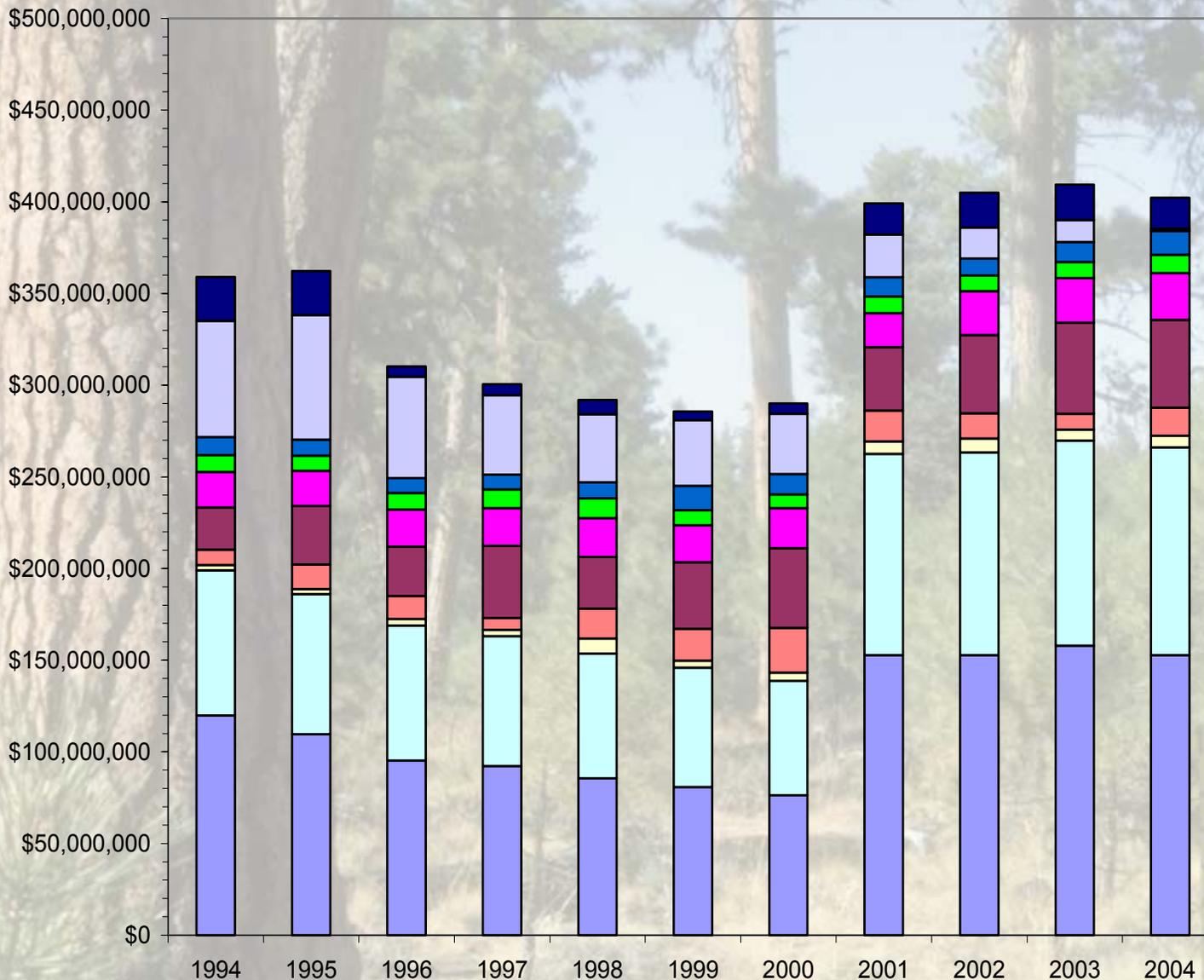


## Leading Indicator Sample 2: Southern Edge of Sheridan

<b>Year</b>	<b>2006</b>	<b>1994</b>	<b>1974</b>
<b># of tax lots</b>	<b>33</b>	<b>28</b>	<b>4</b>
<b># of owners</b>	<b>20</b>	<b>15</b>	<b>4</b>
<b># of dwellings</b> including manuf. homes	<b>15</b>	<b>10</b>	<b>2</b>
<b>Developable acres*</b>	<b>299.86</b> <b>(47%)</b>	<b>----</b>	<b>----</b>

\* Developable acres out of 640 acres determined by 3 Measure 37 tests: Lot-of-Record (length of ownership & capability of land), Large-Lot/ownership (acres owned by single owner), Template (development and capability within 160 acres)

# DRAFT State and Local Government Forest Revenues by Year and Revenue Source 1994-2004



- Forestland Property Tax
- Privilege/Severance Tax
- Forest Products Harvest Tax
- County Forestland
- ODF Fire Protection
- Board of Forestry
- Common School Fund
- Payments in Lieu of Taxes
- Bureau of Land Management
- US Forest Service

Notes:  
 USFS and BLM dollars include Spotted Owl Payments until 2000 and Secure Rural Schools and Community Self-Determination Act payments from 2001 forward, and are not based on harvests from Federal land.

Property Tax returns are an estimate of actual property tax values for most specially assessed forestland.

Privilege Tax includes the Small Tract option for small woodland owners.

## USFS/ODF Example Community Level Model: Central Tillamook

I/O Outcome	Sawmill	Resort Hotel
Direct Sector Jobs	80	80
Average Wage	\$35K	\$12K
Multipliers	high	low
Leakage	low	high
Total Area Jobs	253	138
Total Income	high	low
Socially Preferred	?Low?	?High?

# Indicators

<b>Indicator</b>	<b>Linkage</b>
<b>B.a. Forest Revenues</b>	<b>Yes - Adams (OSU)</b>
<b>B.b. Forest Employment</b>	<b>Yes - ODF (Lettman)</b>
<b>B.c. Consumption vs. Harvest</b>	<b>?</b>
<b>B.d. Non-commodity Contributions</b>	<b>Yes? - Indirect</b>
<b>B.e. Industry Competitiveness</b>	<b>?</b>
<b>C.a Area of Forestland</b>	<b>Yes - direct</b>
<b>C.b Timber Harvests</b>	<b>Yes - direct</b>
<b>D.a Water Quality Index</b>	<b>Possible?</b>
<b>D.b Index of Biotic Integrity</b>	<b>Possible?</b>
<b>D.c Forest Roads</b>	<b>GIS data – ODF/R6</b>
<b>D.d Drinking Water</b>	<b>?</b>
<b>E.a Forest Veg.</b>	<b>Yes - direct</b>
<b>E.b Protected Areas</b>	<b>Yes - direct</b>
<b>E.c Species at Risk</b>	<b>Yes - R6 focal species, OR/WA habitats</b>
<b>F.a Tree Mortality</b>	<b>Yes - direct</b>
<b>F.b Invasives</b>	<b>Yes - direct/indirect</b>
<b>F.c Fuel Treatment</b>	<b>Yes - direct</b>
<b>F.d Fuel Conditions</b>	<b>Yes - direct</b>
<b>G.a., G.b, etc. (carbon)</b>	<b>Yes - McCarter (UW)</b>

A photograph of a pine forest. In the foreground, a large, textured tree trunk is on the left. The ground is covered with dry, yellowish grass and small shrubs. In the background, several tall, thin pine trees stand against a clear blue sky. A yellow measuring tape is visible in the lower right foreground, showing markings from 0 to 10 meters. A light green rectangular box is centered in the image, containing the text "R6 Plan Revisions" in bold blue font.

# **R6 Plan Revisions**

# Support for R6 Forest Plan Revision

Vegetation maps compliant with USFS national and regional mapping standards

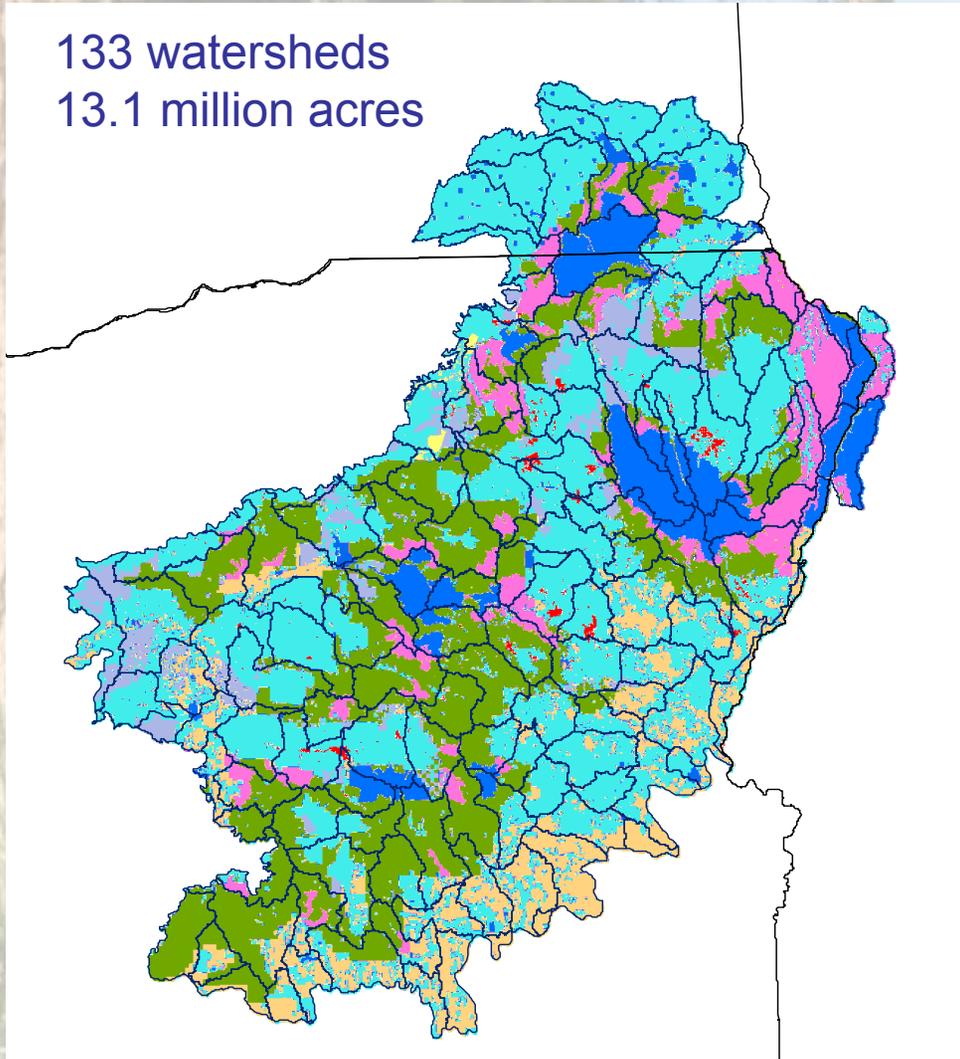
Initial Conditions and 2 modeling scenarios

HRV

Current Management

# Blue Mountains Study Area

133 watersheds  
13.1 million acres

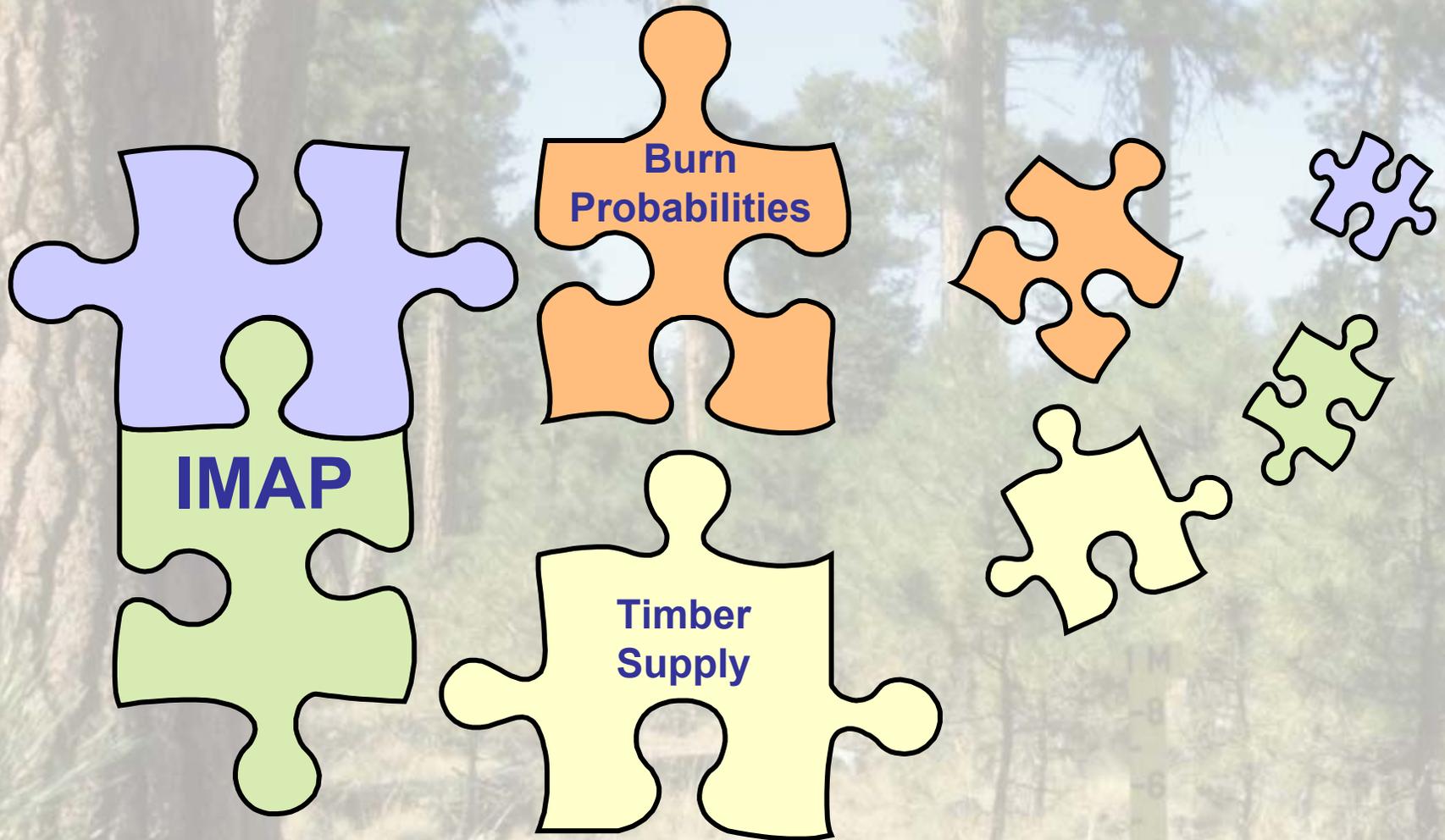


Grassland Shrubland Woodland	Forest
Idaho fescue-prairie junegrass	Hot, dry ponderosa pine
Idaho fescue-bluebunch wheatgrass	Warm, dry ponderosa pine
Green fescue	Warm, dry Douglas-fir
Low sage	Warm, dry grand fir
Montane shrub	Cool, moist
Mountain big sage	Cold, dry
Mountain mahogany	Subalpine woodland
Juniper	
Sanberg's bluegrass- Onespike oatgrass	
Bitterbrush	
Rigid sage	
Greasewood-Saltgrass	
Wyoming big sage	

A photograph of a pine forest. In the center, there is a light green rectangular box containing the word "Research" in bold blue font. In the lower right foreground, a yellow measuring tape is visible, showing markings from 0 to 10 meters. The background consists of numerous tall, thin pine trees under a clear blue sky. The ground is covered with dry, yellowish grass and some small shrubs.

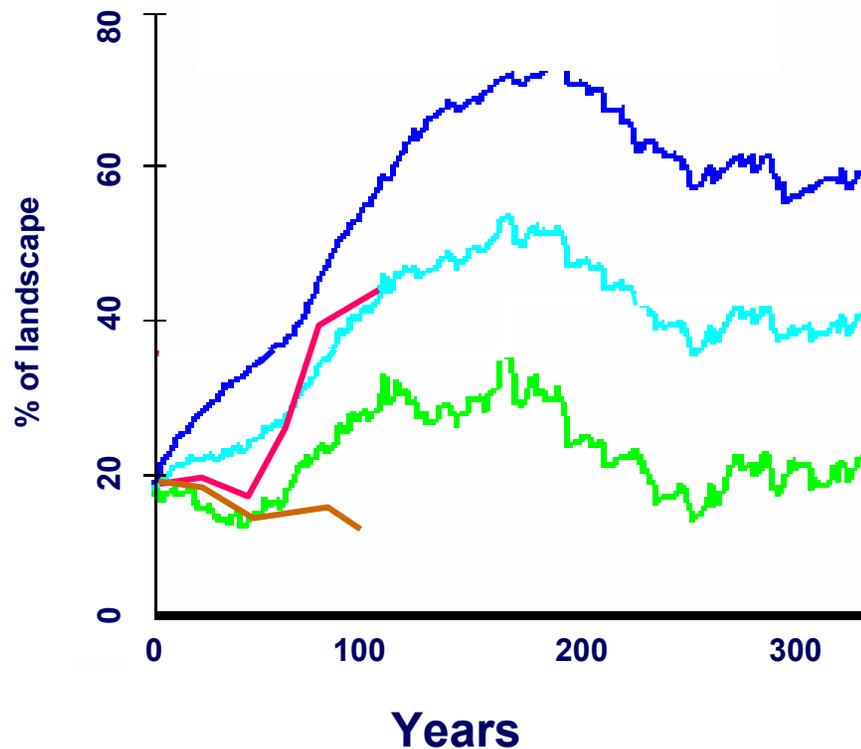
# Research

# Research Plug-N-Play



# Time Lags and Real Differences

Important characteristics may change slowly or episodically or both



- Reality takes one path of the huge number possible
- Within range of expected behavior?
- If not, why?
- Is the model wrong?
- External factors changing?

# Future Directions

- Refine fire and insect disease year variability estimates
- Add development rates to models
- Examine the effects of variability and uncertainty on important landscape attributes (e.g. high severity wildfire, economics, etc.)
- Link to project design and cumulative effects
- Others...

A photograph of a forest landscape with tall pine trees and a grassy undergrowth. A light green rectangular box is overlaid in the center, containing the title text. In the bottom right corner, a yellow measuring tape is visible, showing markings from 0 to 10 meters.

# **NW Forest Plan Status and Trends Monitoring**

# Northwest Forest Plan status and trends monitoring

Vegetation maps updated to 2007 for the  
15-yr report

Long-term projections of alternative  
management scenarios,  
esp. in fire-prone provinces

A photograph of a pine forest. In the foreground, a large, textured tree trunk is on the left. The ground is covered with dry, yellowish grass and small shrubs. In the background, several tall, thin pine trees stand against a clear blue sky. A yellow measuring tape is visible in the lower right foreground, showing markings from 0 to 10 meters. A light green rectangular box is centered in the image, containing the text "Brainstorming - Needs" in bold blue font.

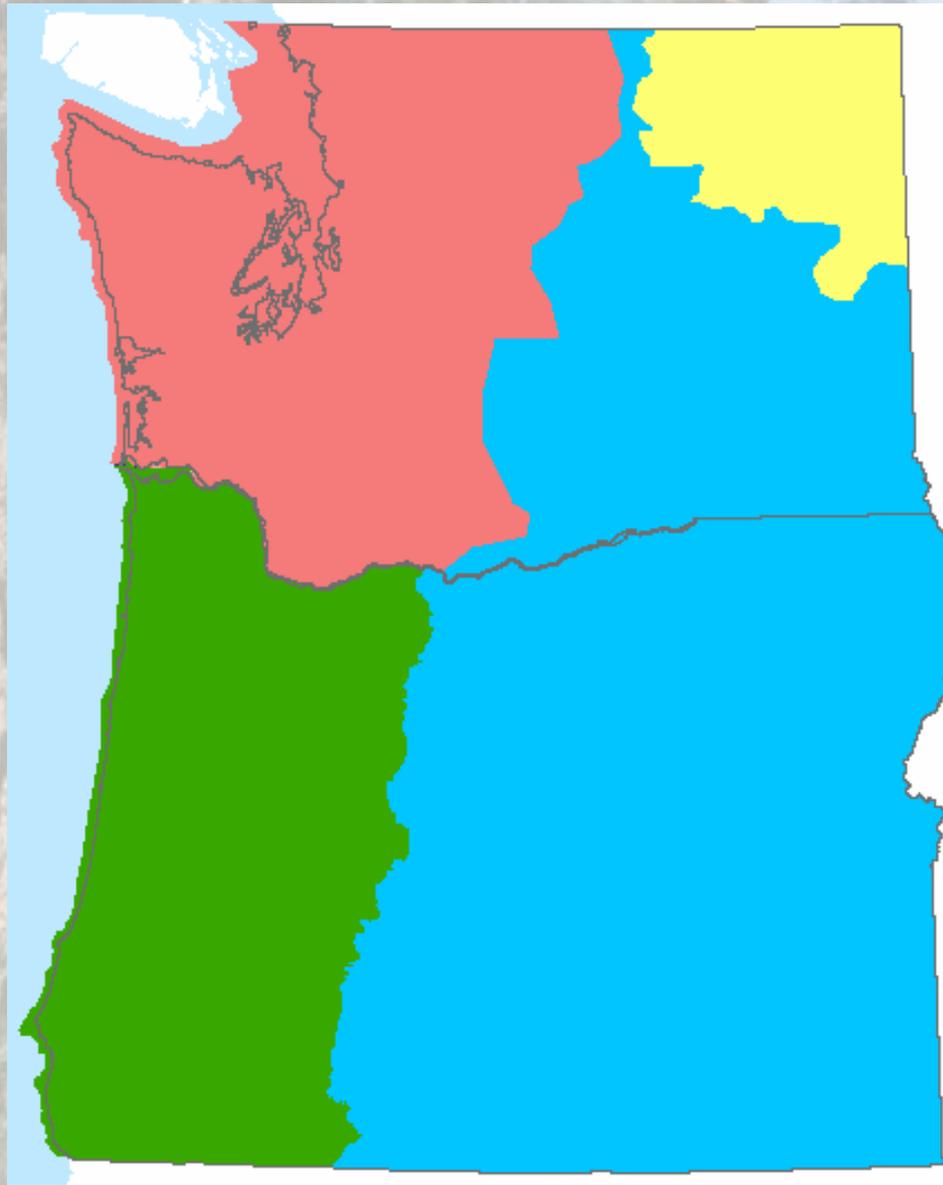
# Brainstorming - Needs

# Charter

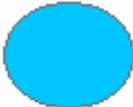
1 M  
-8  
-6  
-4  
-2

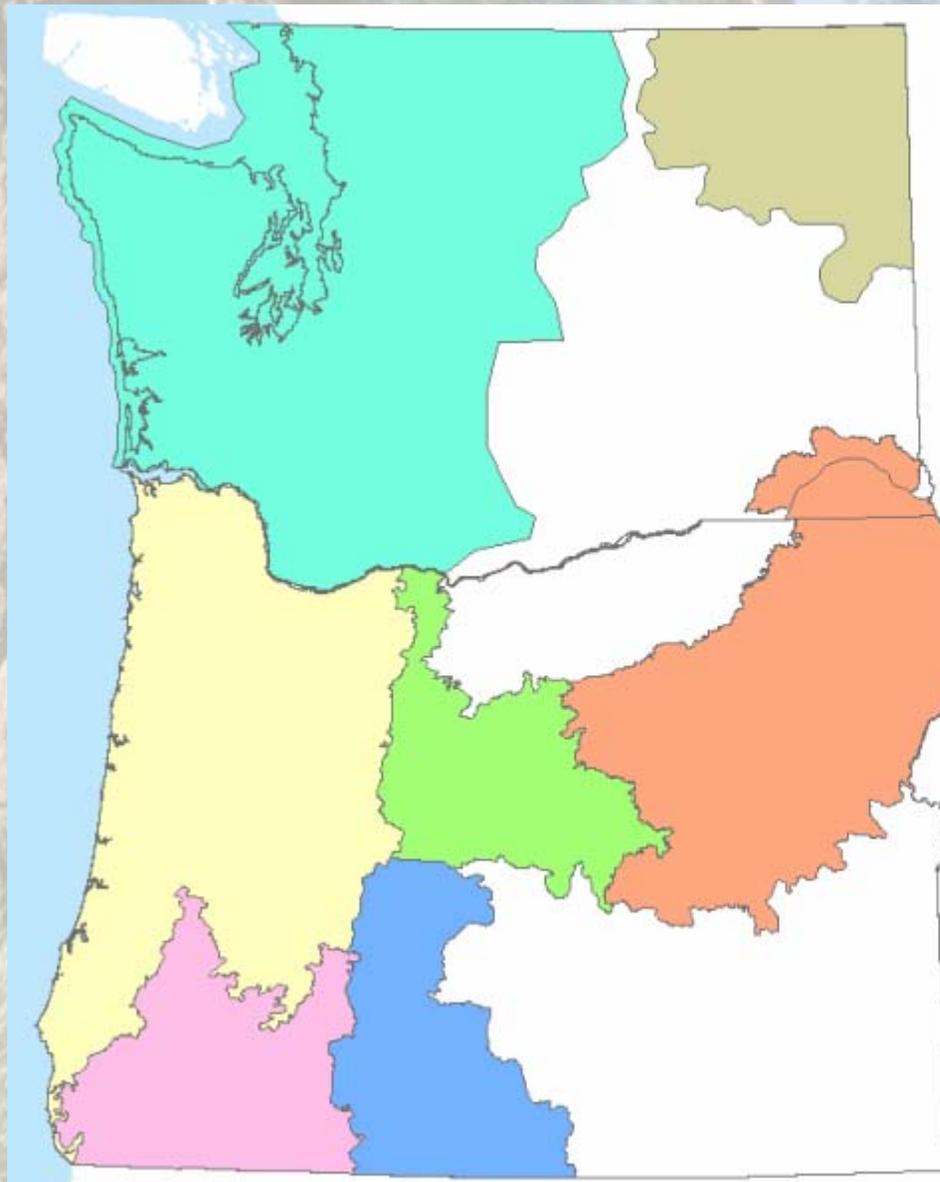
A photograph of a pine forest. In the foreground, a large, textured tree trunk is on the left. In the lower right, a yellow measuring tape is visible, showing markings for 2, 4, 6, 8, and 1 meter. The background is filled with numerous tall, thin pine trees under a clear blue sky. A central text box is overlaid on the image.

# **Proposed Schedule of Products**



## Vegetation Map Proposed schedule

-  9/06 Complete!
-  6/07
-  3/08
-  12/08



## VDDT Models Proposed schedule

- NE Or - Current
- E Cas S Or - fy07
- E Cas N Or - fy07
- SW OR - fy08
- W WA - fy09
- NE WA - fy10

A photograph of a pine forest. In the center, there is a light green rectangular box containing the text "Budget and Funding" in a bold, dark blue font. In the lower right foreground, a yellow measuring tape is visible, showing markings for 2, 4, 6, 8, and 1 meter. The background consists of numerous tall, thin pine trees with green needles, set against a clear blue sky. The ground is covered with dry, yellowish-brown grass and some small shrubs.

# Budget and Funding

Partner Contributions	fy06	fy07	fy08	fy09	fy10	Total
<b>PNW Research Station</b>						
In-kind	\$180,320	\$174,214	\$182,350	\$223,399	\$223,399	\$983,682
Cash	\$154,775	\$106,830	\$112,020	\$117,469	\$117,469	\$608,563
<b>Total</b>	<b>\$335,095</b>	<b>\$281,045</b>	<b>\$294,370</b>	<b>\$340,868</b>	<b>\$340,868</b>	<b>\$1,592,245</b>
<b>R6 IMAP</b>						
Cash	\$97,171	\$259,456	\$261,806	\$275,332	\$275,332	\$1,169,096
<b>Total</b>	<b>\$97,171</b>	<b>\$259,456</b>	<b>\$261,806</b>	<b>\$275,332</b>	<b>\$275,332</b>	<b>\$1,169,096</b>
<b>R6 IM</b>						
In-kind	\$163,389	\$177,119	\$184,383	\$253,459	\$253,459	\$1,031,810
Cash	\$117,983	\$53,734	\$56,320	\$0	\$0	\$228,037
<b>Total</b>	<b>\$281,372</b>	<b>\$230,853</b>	<b>\$240,703</b>	<b>\$253,459</b>	<b>\$253,459</b>	<b>\$1,259,847</b>
<b>NFWP Regional Monitoring</b>						
In-kind	\$64,330	\$104,032	\$109,059	\$114,337	\$114,337	\$506,095
Cash	\$32,321	\$68,521	\$83,559	\$82,250	\$82,250	\$348,901
<b>Total</b>	<b>\$96,651</b>	<b>\$172,553</b>	<b>\$192,617</b>	<b>\$196,587</b>	<b>\$196,587</b>	<b>\$854,996</b>
<b>ODF</b>						
In-kind	\$78,624	\$82,555	\$86,683	\$91,017	\$91,017	\$429,896
Cash	\$155,456	\$112,843	\$118,083	\$123,585	\$123,585	\$633,551
<b>Total</b>	<b>\$234,080</b>	<b>\$195,398</b>	<b>\$204,766</b>	<b>\$214,602</b>	<b>\$214,602</b>	<b>\$1,063,447</b>
<b>WWETAC</b>						
Cash	\$422,536	\$388,626	\$66,868	\$0	\$0	\$878,030
<b>Total</b>	<b>\$422,536</b>	<b>\$388,626</b>	<b>\$66,868</b>	<b>\$0</b>	<b>\$0</b>	<b>\$878,030</b>
<b>Project Totals</b>						
In-kind	\$486,663	\$537,921	\$562,475	\$682,212	\$682,212	\$2,951,483
Cash	\$980,243	\$990,010	\$698,655	\$598,635	\$598,635	\$3,866,178
<b>In-kind+Cash</b>	<b>\$1,466,905</b>	<b>\$1,527,931</b>	<b>\$1,261,130</b>	<b>\$1,280,847</b>	<b>\$1,280,847</b>	<b>\$6,817,660</b>
<b>Total Need</b>	<b>\$1,466,905</b>	<b>\$1,551,246</b>	<b>\$1,676,935</b>	<b>\$1,834,250</b>	<b>\$1,834,250</b>	<b>\$8,363,584</b>
<b>Shortfall</b>	<b>\$0</b>	<b>\$23,315</b>	<b>\$415,805</b>	<b>\$553,402</b>	<b>\$553,402</b>	<b>\$1,545,924</b>

A photograph of a pine forest. In the center, a light green rectangular box contains the text "Next Meeting" in a bold, dark blue font. In the lower right foreground, a yellow measuring tape is visible, showing markings for 2, 4, 6, 8, and 1 meter. The background consists of numerous tall, thin pine trees with green needles, set against a clear blue sky. The ground is covered with dry, yellowish grass and some small shrubs.

**Next Meeting**